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A Probabilistic Approach to Infer the Unknown Redshifts of Long-duration Gamma-Ray Bursts Observed by BATSE JOSHUA OSBORNE, AMIR SHAHMORADI, University of Texas at Arlington, ROBERT NEMIROFF, Michigan Technological University — Here we present a purely probabilistic approach to inferring the redshifts for 1366 Long-duration Gamma-Ray Bursts (LGRBs) as detected by the Burst and Transient Source Experiment (BATSE). This is done through a careful modeling of the underlying redshift distribution and four intrinsic prompt gamma-ray emission properties: the spectral peak energy (Epz), the isotropic 1024ms peak luminosity (Liso), the total isotropic emission (Eiso), as well as the intrinsic duration (T90z). Additionally, we also take into account both the sample incompleteness of our dataset as well as the BATSE detection mechanism. There are two fundamental assumptions to our approach: 1. LGRBs trace the Cosmic Star Formation Rate and 2. the joint 4-dimensional distribution of the prompt gamma-ray emission properties can be modeled by a multivariate log-normal distribution. We then explore the posterior Probability Density Functions (PDFs) using the Parallel Delayed-Rejection Adaptive Metropolis-Hastings Markov Chain Monte Carlo (ParaDRAM) algorithm in order to find the optimal parameters for our intrinsic properties distributions and using this calibrated model we are then able to constrain the PDFs of the redshift distribution. Lastly, we compare our results to previous redshift estimates of other works.

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